

CLAIMS

1. A solid shape describing method for describing a solid model in a 3-dimensional space with use of a bit-map,

5 wherein a coarse grid coordinate system and a fine grid coordinate system are used, and

wherein it is defined so that an area occupied by said fine grid coordinate system and part or whole of an area occupied by said coarse grid coordinate system come to be laid
10 in layers.

2. A solid shape describing method for describing a solid model in a 3-dimensional space, comprising the steps of:

defining a fixed coordinate system with respect to said 3-dimensional space;

15 defining a single or plurality of floating coordinate systems;

describing a relative positional relationship algebraically between said respective floating coordinate systems and said fixed coordinate system;

20 defining a single or plurality of three-dimensional cell arrays; and

describing the correspondence between said respective floating coordinate systems and said respective three-dimensional cell arrays.

25 3. A remote slid machining method for transmitting solid

shape data through a communication line to manufacture a real body according to said shape data;

wherein said shape data is described using said solid shape describing method as described in claim 1 or 2.

5 4. A solid shape data comparing method for making a comparison among a plurality of solid shape data items,

wherein one of said plurality of solid shape data items is converted to a solid model described using said solid shape describing method as described in claim 1 or 2.

10 5. The method according to claim 2, further comprising a floating coordinate system order defining function for defining an order among said plurality of floating coordinate systems.

15 6. A solid shape displaying method for displaying an external view or cross-sectional view of a solid model described using said solid shape describing method as described in claim 2, said method comprising the steps of:

obtaining a priority level of each of said plurality of three-dimensional cell arrays by evaluating whether said array
20 represents a global or local solid shape; and

displaying said three-dimensional cell arrays in the order of their priority levels.

7. A solid shape transmitting method for transmitting said solid model as described in claim 2 through a communication
25 line, said method further comprising the steps of:

obtaining a priority level of each of said plurality of three-dimensional cell arrays by evaluating whether said array represents a wide range or local shape of said solid model; and

5 transmitting said three-dimensional cell arrays in the order of their priority levels.

8. A solid shape data converting method for converting solid shape data to a solid model described using said solid shape describing method as described in claim 2;

10 wherein each of said plurality of floating coordinate systems is defined according to the surface roughness, surface position variation, surface element size, or surface curvature radius included in said solid shape data with respect to a solid shape.

15 9. The method according to claim 2, further comprising an element defining function for enabling an attribute of element characteristics to be added to said floating coordinate system or a voxel corresponding to said three-dimensional cell array.

20 10. The method according to claim 2, further comprising a detailed description availability defining function for adding an attribute denoting whether or not another floating system describes a target solid shape more in detail, to said floating coordinate system or a voxel corresponding to said
25 three-dimensional cell array.

11. A solid shape describing apparatus provided with a function for describing a solid model in a three-dimensional space using a bit-map,

wherein said apparatus is further provided with a coarse
5 grid coordinate system and a fine grid coordinate system, and

wherein said apparatus is configured so that it is defined that an area occupied by said fine grid coordinate system and part or whole of an area occupied by said coarse grid coordinate system are laid in layers.

10 12. A solid shape describing apparatus provided with a function for describing a solid model in a three-dimensional space, said apparatus further comprising:

a fixed coordinate system defining function for defining a fixed coordinate system with respect to said

15 three-dimensional space;

a floating coordinate system defining function for defining a single or plurality of floating coordinate systems;

a fixed-floating coordinate system relative relationship describing function for describing a relative positional
20 relationship algebraically between said respective floating coordinate systems and said fixed coordinate system;

a three-dimensional cell array defining function for defining a single or plurality of three-dimensional cell arrays; and

25 a floating coordinate system - three-dimensional cell

array correspondence describing function for describing the correspondence between said respective floating coordinate systems and said respective three-dimensional cell arrays.

13. A remote solid machining system for solid bodies,
5 which includes transmitting means for transmitting shape data through a communication line and a machining unit for manufacturing a real product according to said shape data,

wherein said shape data is described using said solid shape describing apparatus as described in claim 11 or 12.

10 14. A CAD/CAM system for solid shapes, which includes a solid modeling unit for manufacturing a real body according to said original shape data and a solid measuring unit for measuring said real body,

wherein said original shape data is described using said
15 solid shape describing apparatus as described in claim 11 or 12, and

wherein said original shape data is corrected according to the measured data obtained by said solid measuring unit.

15. The CAD/CAM system according to claim 14,

20 wherein said solid measuring unit is a CT unit.

16. A CAD/CAM system for solid shapes, which includes a solid modeling unit for manufacturing a real body according to its original shape data and a solid measuring unit for measuring said real body,

25 wherein said original shape data is described using said

solid shape describing apparatus as described in claim 11 or 12,; and

wherein said solid measuring unit determines a measuring procedure by referring to said original shape data.

5 17. The CAD/CAM system according to claim 16,

wherein said solid measuring unit changes a measuring resolution to another according to the size of a voxel corresponding to said three-dimensional cell array as described in claim 12.

10 18. A solid shape editing unit provided with a function for creating or changing said solid model as described in claim 12, said unit further comprising:

displaying means for displaying said solid model; and
a function for displaying said floating coordinate system

15 and said solid model in layers.

19. A solid shape editing method for displaying or transmitting said solid model as described in claim 2,

wherein said method for determining a priority level for said three-dimensional cell array, as described in claim 10

20 or 11 system; and

wherein one of said methods is selected, one of said methods being used to set a higher priority level for said wide range three-dimensional cell array and the other being used to set a higher priority level for said narrow range

25 three-dimensional cell array.

20. The system according to claim 13,

wherein said shape data is described using said CAD/CAM system for solid shapes, as described in claim 14, and

wherein said machining unit determines whether to refer
5 to another floating coordinate system for describing a detailed solid shape according to the resolution of a machining tool.

21. The CAD/CAM system according to claim 14, further comprising:

10 a function for selecting part or whole of said measured data; and

a function for copying a selected part to said original shape data.

22. A medium for storing said solid model as described
15 in claim 11 or 12.